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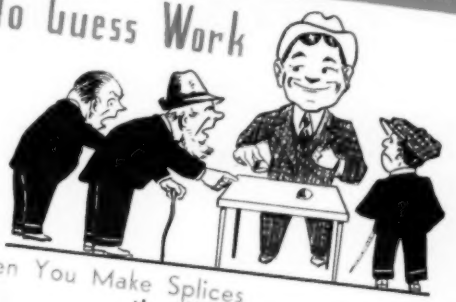

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ELECTRONIC DEVICES

In Telephony

By ARTHUR L. ALBERT
Professor of Communication Engineering, Oregon State College

***MODULATION BY BOTH** vacuum tubes and copper-oxide varistors is discussed in this seventh article of a series on electronics and electronic devices in telephone work. Each method is treated separately. Previous articles have been devoted largely to vacuum tubes*

THE PREVIOUS articles of this series have largely been devoted to vacuum tubes. Until of late this was the only electronic device (in the usual sense of the word at least) widely used in commercial telephone systems. Recently, however (TELEPHONY of March 26), the copper-oxide rectifier has been introduced. In the form of the so-called varistor it is employed in the new carrier-telephone systems for modulation and demodulation. This article will, accordingly, be devoted to a study of modulation by both vacuum tubes and copper oxide varistors.

In wire telephony, modulation makes possible the simultaneous transmission of several spoken messages over the same pair of line wires but on different carrier channels. In wireless telephony, or radio, it makes possible the simultaneous transmission of many messages through the same intervening space, but over different radio channels.

In reality, modulation, whether for carrier telephone or radio purposes, is a method of frequency translation. The voice frequencies, which for commercial telephone purposes may be considered as extending from about 200 to 3,000 cycles, are merely moved to much higher frequencies. So great is the misunderstanding regarding modulation that it seems advisable to discuss the true nature of a modulated wave before proceeding with a consideration of the actual methods used.

Nature of Modulated Waves

From one viewpoint, the term "carrier" telephony is misleading, because in reality the carrier does *not* "carry" the voice to the distant station. What actually happens is that the band of voice-frequency *variations*, containing the intelligence, is translated from low-frequency to high-frequency variations by the process of modulation. At the distant end, demodulation (or detection as it is usually called in radio) reduces this band of variations conveying the intelligence back to the voice-frequency range.

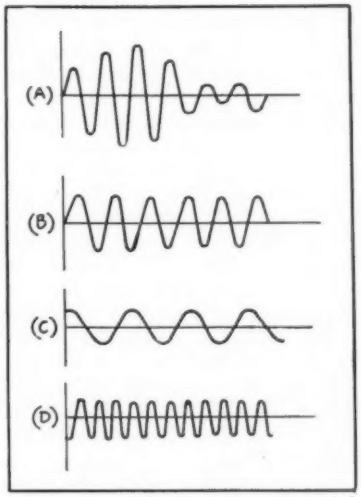


Fig. 1. A modulated carrier such as (a) in reality is composed of three components, (b) the carrier, (c) the lower side band, and (d) the upper side band.

Fundamentally, modulation and demodulation are the same processes. In practice, however, the term modulation (usually, but not always by any means) is used to describe the process by which the band of audible voice-frequency variations is raised in frequency, and demodulation (or detection) to describe the process by which the band is lowered back to the voice-frequencies so that the speech may again be audible.

Cathode-ray oscilloscopes are now so common that the "picture" or trace of a modulated wave has been viewed by many. When a relatively high-frequency carrier wave is modulated by a pure sine wave, such as 1,000 cycles, then the output of the modulator will look somewhat as in Fig. 1-a. Since the outline, or "envelope," of the modulated carrier varies in accordance with the modulating 1,000-cycle wave, the conception of the carrier wave "carrying" the signal may seem logical.

Of course, if the voice is used to modulate the carrier wave, the envelope of the modulated signal will be irregular in accordance with the voice-frequency variations. In other words, from one viewpoint, all that appears to happen is that by the process of modulation more or less of the carrier is allowed to flow, and that in some vague manner the intelligence is carried by the envelope of the wave.

Actually, however, the modulated wave is much more interesting, and far more complex than this as can be readily demonstrated with a wave analyzer. Had this instrument been as generally available at an early date as were oscillographs and oscilloscopes, probably the more fundamental nature of modulation rather than the approximate viewpoint just given would have been more widely understood.

To be specific, the so-called modulated carrier wave (a) of Fig. 1 is in reality a complex wave composed of three separate sine-wave components. These are the carrier-frequency (b), the lower side band (c) and the upper sideband (d). This can be proved by analyzing a wave such as (a) with a wave analyzer, or by combining three waves such as (b), (c) and (d) by a point-to-point addition just as any alternating components are added.

Thus, a modulated wave such as Fig. 1 (a) contains a carrier component, and upper and lower side bands. If the modulating signal is a pure sine wave of fixed magnitude, then the carrier and both side bands are constant. If the modulating signal is a voice-frequency speech wave, then the carrier *is still a constant value*, but *each* side band varies in accordance with the speech variations.

From this fact it follows that *each* side band contains the original intelligence, and that it is only necessary to send one side band to the distant station to transmit the intelligence. Those familiar with carrier telephony know this to be true. As will be explained in the next article, a carrier frequency must be available

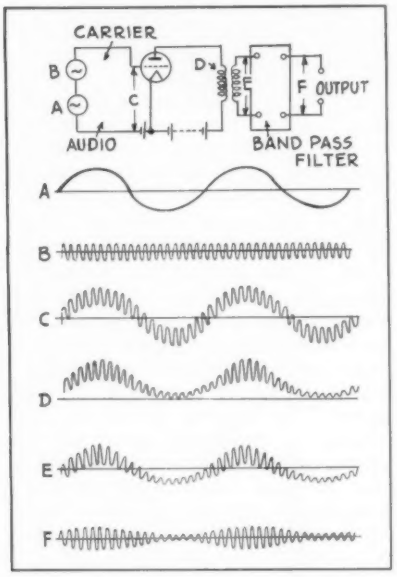


Fig. 2. Simplified circuit and analysis of currents and voltages for illustrating the principles involved in a method of modulation used in carrier telephony.

at the distant end for translating the intelligence present in the side bands back to the audible voice frequencies, but this offers no difficulties.

Theory of Modulation

From the preceding paragraphs it is evident that during the process of modulation new frequencies, the so-called side bands, are created. Thus, modulation may be looked upon as a type of distortion, because distortion changes the wave shape and causes frequency components to exist in the output which were not present in the input. (The distortion caused by iron-cored coils is an example.) In fact, modulation often is considered as being a *desired* type of nonlinear distortion.

As stated in the first paragraph, this article will consider modulation by both vacuum tubes and by copper-oxide varistors. Since there is very little in common in the working details of these two methods, they will be treated separately.

When modulation is accomplished with vacuum tubes, the tubes are *not* operated as distortionless amplifiers as is done when they are used to amplify a speech signal; instead they are operated so as to *distort* the signal and thus create the desired side bands.

There are several ways in which this may be done but, from the telephone standpoint, the principle of one method is illustrated by Fig 2. In this circuit, both the modulating voice voltage, A, (assumed for convenience to be a pure sine wave) and the modulated carrier voltage, B, are impressed on the grid of the tube, giving a resulting grid signal voltage as in C.

If the bias of the tube were so adjusted that operation were on the *straight* part of the grid voltage-plate current curve of Fig. 3, then the tube would merely amplify the two signals, and would not create the side bands. If, however, the grid bias is so great that the combined signal voltage C is impressed on the curved or non-linear part of the characteristic curve of the tube, then the plate current which flows will, as shown by D, be distorted, and will not be a replica of the grid input signal.

After the direct component of the plate current, D, is removed by the transformer, and the audio component and other undesired frequencies are removed by the filter, the output voltage will be as shown by F. This output voltage wave is similar to the wave of Fig. 1, and hence contains the carrier frequency and the two side band components as was previously explained.

Frequency Relations in Modulated Signals

The relations which have been discussed in the preceding paragraphs can be verified both experimentally and mathematically. Thus, a tube may be arranged as in Fig. 2, and a wave analyzer or some variable tuned detector arrangement used to study the output.

When the bias is adjusted so that operation is on the straight or linear portion of the grid voltage-plate current characteristic curve, then only an audio-frequency component and a carrier-frequency component will be found in the output. If the bias is increased so that operation is on the curved portion, then the carrier component and the created side band will exist in the output of the circuit of Fig. 2.

To determine these relations mathematically, the usual procedure is as follows: An expression for the instantaneous value of the combined

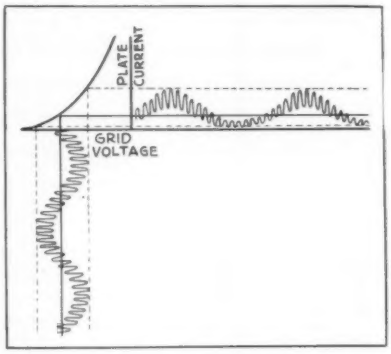


Fig. 3. In the method of modulation of Fig. 2, the bias on the tube is so adjusted that the signal voltage impressed on the grid varies over the curved portions of the grid voltage—plate current curve, thereby causing distortion and creating the desired side bands.

grid voltage due to the voice-frequency voltage, E_v, and the carrier-frequency voltage, E_c, is

$$e_g = E_v \sin \omega_v t + E_c \sin \omega_c t$$

The equation for the *curved* portion of the curve of Fig. 3 over which the tube operates as a modulator is a mathematical series of the form,

$$I_p = ae_g + be_g^2 + \text{———},$$

where a and b are constants.

When the values of the instantaneous grid current are substituted in the equation for the plate current and the equation expanded mathematically the expression for the modulated output wave will be obtained. Leaving out direct-current terms and alternating-current terms which are of no present interest, the simplified equation for the modulated wave is

$$i_p = aE_c \sin \omega_c t + bE_cE_v \cos (\omega_c - \omega_v)t - bE_cE_v \cos (\omega_c + \omega_v)t.$$

Since $\omega = 2\pi f$, this equation shows that in a modulated wave, such as in Figs. 1 and 2, there exists a carrier frequency component as given by the first term, a lower side-band frequency component as given by the second term, and an upper side band as given by the third term.

From these discussions it follows that if the carrier wave, E_c, is 20,000 cycles, and if the voice wave,

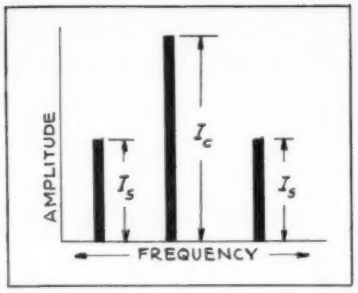


Fig. 4. In a completely modulated wave (M = 100 per cent) the relation between the carrier current (or voltage) and each side band is as shown.

E_v, is represented by 1,000 cycles, then the modulated signal such as Figs. 1 and 2 will contain a 20,000-cycle component, a lower side band of 19,000 cycles, and an upper side band of 21,000 cycles. Of course, speech is not a constant frequency, but in a commercial telephone circuit excellent intelligibility is provided by a band from about 250 to 2,750 cycles wide.

When the carrier of 20,000 cycles is modulated by speech of these frequencies, the output would be a constant frequency component of 20,000 cycles, a lower side band of from 17,250 to 19,750 cycles and an upper side band of from 20,250 to 22,750 cycles. Of course, these side bands will be changing in accordance with the speech signals to make the transmission of intelligence possible.

Power Relations in Modulated Signals

As has been stated elsewhere in this article, the carrier-frequency component is in itself not changed but new components called side bands are created. When these are combined with the carrier as in Fig. 1, it appears that all that has happened is that the modulating process has allowed more or less of the carrier to flow in accordance with the speech variations. This has given rise to the use of the somewhat misleading term *amplitude modulation* in describing this process.

When the strength of the *combined* signal wave of Fig. 1 varies until the resultant wave strikes the zero axis, then the wave has been completely modulated. This is termed 100 per cent modulation. For this percentage modulation, the side bands are each half the magnitude of the carrier component. These relations are as indicated by Fig. 4.

When the percentage modulation (usually expressed by m) is less than 100 per cent, then the magnitude of *each* side band is equal to $mI_c/2$ or $mE_c/2$, where I_c and E_c represent the carrier current and voltage respectively. In modern radio broadcast stations the modulation approaches 100 per cent, but this high degree of modulation is not used in carrier telephone circuits.

Power is equal to I^2R or to E^2/R, and is, therefore, proportional to the magnitude of either the current or voltage squared. If it is, for the moment, assumed that the magnitude of the carrier current is 1.0, and that the wave is fully modulated, then each side band will be equal to 0.5. Squaring these numbers, the power in the carrier is still proportional to 1.0, but that in *each* side band becomes proportional to 0.25.

The total power in a completely modulated wave containing a carrier and two side bands is, therefore, 1.5 times that in the carrier component alone; or, on a percentage basis, 66-2/3 per cent of the power in a completely modulated wave represents the carrier component (which is the same before and during modulation) and 33-1/3 per cent is in the side bands.

These relations show a very important characteristic of the output of a completely modulated signal. The equipment must devote 66-2/3 per cent of its power-handling capacity to passing the carrier which contains no intelligence, and only 33-1/2 per cent to handling the components transmitting the message. Also, since *each* side band contains within *itself* the complete signal variations, one side band alone is all the signal which *must* be passed to transmit the intelligence to the distant station.

In carrier telephone systems, which work at low power levels, the fact that much of the power-handling capacity of the apparatus is not effectively used is not so important. In transoceanic radiotelephone communication, however, this fact is of very great importance. The transmitters used must handle many kilowatts of power to provide reliable service, and the power-handling stages and associate equipment are very expensive.

Thus, in many of these radiotelephone systems one side band and the carrier are suppressed, and one side band only is transmitted, since each side band contains within itself the complete message. This practice is not followed in radio broadcast transmitters, largely because more elaborate radio-receiving sets would be required. In some carrier-telephone systems, the carrier and sometimes the carrier and one side band are suppressed. This is done, however, to save "frequency space" rather than for power-handling reasons.

Carrier Suppression

Since but only one side band need be transmitted to the distant station to convey the intelligence, the carrier and the undesired side band are usually suppressed at the transmitting end. A balanced modulator circuit is used to suppress the carrier, and the undesired side band is prevented from flowing by a filter. As will be explained in the next article of this series, the carrier frequency, necessary for demodulation is supplied at the distant station by an oscillator.

A simplified circuit of a balanced modulator which suppresses the carrier is shown in Fig. 5. This circuit is similar to the push-pull amplifier considered in the article on power amplifiers appearing in TELEPHONY of September 23.

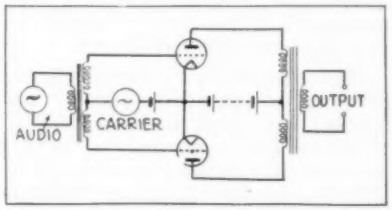


Fig. 5. A balanced modulator for suppressing the carrier as in a carrier-telephone circuit.

As this circuit shows, the voice-frequency signal voltage and the carrier-frequency voltage both are impressed simultaneously on the grid of *each* tube. These are biased to operate on the non-linear grid voltage-plate current portion of their characteristic curves. Thus in each tube, the signals are distorted and the desired side bands exist in the output.

The carrier signal voltage does not exist in the output (if the tubes are balanced) for the following reason: Considering only the *carrier* voltage, for the positive half cycle, both grids are driven *more* positive, and for the negative half cycle, both grids are driven *less* positive.

Thus, the changes in the plate current are in the *same* direction for *each tube;* but since these components flow in opposite directions in identical windings on the same core, the magnetic effects are cancelled and negligible carrier voltage is induced into the secondary.

VALUE AND PRICE

Those things called dear are, when justly estimated, the cheapest. They are attended with much less profit to the artist than those which everybody calls cheap. A disposition for cheapness and not for excellence . . . . is the most frequent and certain cause of the decay of arts and manufactures.—JOHN RUSKIN.

Copper-oxide rectifiers were introduced commercially in about 1927. They consist essentially of stacks of copper disks; a layer of cuprous oxide having been formed on one side of each disk. These disks offer low resistance to *conventional* (not electron) current flow in the direction from oxide to copper, and offer high resistance to the flow of current in the opposite direction.

The magnitude of the resistance also can be varied by changing the voltage impressed, giving a stack of disks of the type used in carrier systems the characteristics shown in Fig. 6. Because of this control feature, these stacks of disks are sometimes termed "varistors." Of course, the characteristics can also be given different values by using disks of different sizes.

As mentioned in the introduction to this article, varistors are replacing the vacuum tube as modulators and demodulators in the new carrier-telephone systems. A recent paper "Copper Oxide Modulators in Carrier Telephone Systems," by R. S. Caruthers (Electrical Engineering September, 1939) describes their theory as modulators in much detail. As is there shown, many circuits are possible, giving a wide variety of relations such as carrier suppression, etc. In other articles, the action of these varistors as modulators has been explained as a switching action (Bell Laboratories Record, March, 1937.)

A simple explanation of the copper-oxide varistor modulator shown in Fig. 7-A is as follows: It is assumed that when the oxide is positive and the copper is negative the resistance of the disks is zero; and that when the oxide is negative and the copper is positive, the resistance of the disks is infinite. The carrier voltage, E_c, is *large* compared with the speech signal, E_v, and thus the carrier acts as a control element.

When the carrier voltage has the polarities as indicated, the equivalent circuits are as shown in Figs. 7-B and 7-C. It is seen that by the action of the carrier voltage, E_c, the path of current which flows due to the voice voltage, E_v, is reversed. That is, the voice voltage, E_v, will first force a current up through R_2, and then down through R_3 as the carrier voltage, E_c, varies the path.

The resistor, R_2, represents the line and distant receiving station. The resistance of the current path between the voice voltage, E_v, and the load resistor, R_3, is controlled by the carrier voltage, E_c. The resistance of this path is

$$(R_1 R_3 + R_2 R_3 + R_1 R_2)/R_2.$$

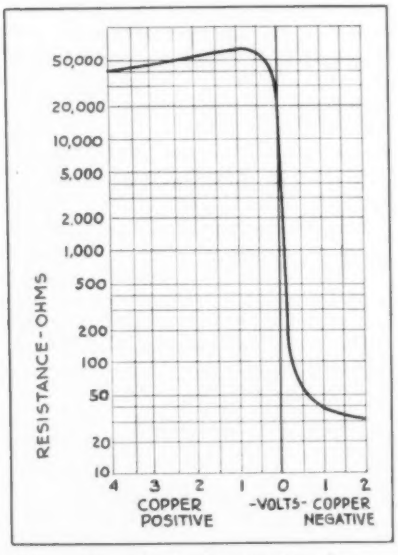


Fig. 6. Approximate characteristics of a copper-oxide varistor.

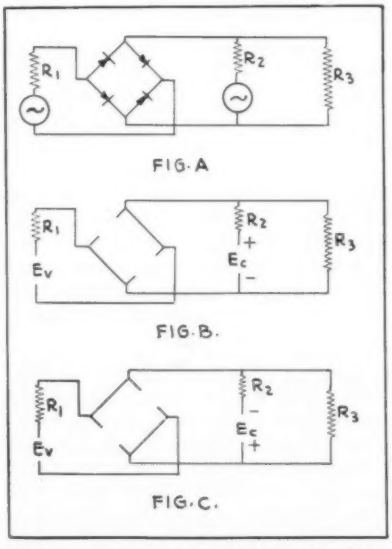


Fig. 7. Diagrams for explaining the action of the copper-oxide varistor modulator.

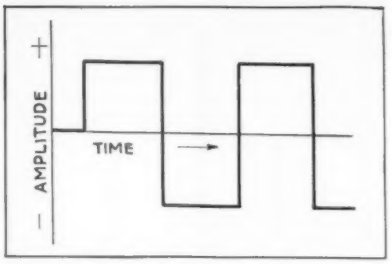


Fig. 8. With an ideal varistor and the carrier in control of the circuit as explained in this article, the transfer impedance of the circuit of Fig. 7 varies as shown.

As viewed from the source of voice voltage, E_v, this resistance is first a positive value, and then an equal negative value because of the action of the carrier voltage, E_c. Thus, the resistance of the path is varying as a recurring function having the shape of a rectangular wave as shown in Fig. 8.

Merely to simplify the mathematical process, it is convenient to use the conductance G of the path between the voltage, E_v, and the load resistor, R_3. This conductance is the reciprocal of the resistance as previously given, and thus the conductance must also be varying as a rectangular wave.

Using the equation for a rectangular wave, the conductance at any instant becomes

$$g = \frac{4G}{\pi}(\sin \omega t + \frac{1}{3} \sin 3\omega t + \frac{1}{5} \sin 5\omega t + \text{etc.}),$$

where G is the maximum value of the conductance. This equation shows that a rectangular wave, such as Fig. 8, contains the harmonic frequency terms $3\omega t$, $5\omega t$, etc., where $\omega = 2\pi f$, and f is the fundamental frequency of the wave.

The product of voltage and conductance gives current. Hence, when the instantaneous voice voltage, $e_v = E_v \sin \omega_v t$, is multiplied by the instantaneous value of the conductance, g, as given by the equation in the preceding paragraph, the instantaneous value of the current through the load resistor, R_3, (representing the line and distant receiving station) is obtained. This current will be found to contain the carrier frequency and the two desired side band components, and hence modulation has been caused by the varistor.

Summary

Modulation is the process by which two waves are simultaneously impressed on some device which has

(Please turn to page 34)

In the Nation's Capital

by Francis X. Welch

Special Washington, D. C., Correspondent for TELEPHONY

WESTERN UNION'S experience with National Labor Relations Board provides a lesson on how to avoid getting into trouble with the federal body or with state labor relations boards in cases where they have jurisdiction. . . . Some rules gathered from leading decisions of the NLRB will help in avoiding difficulty. . . . A five-point program based on these decisions is suggested

THE RECENT action of the National Labor Relations Board in outlawing the 21-year-old association of Western Union employes focuses the spotlight of federal labor regulation once more on the communications field. It would be risky, if not actually improper, to comment upon the merits of the NLRB ruling while a court appeal is pending; and from the present outlook such an appeal is going to be pending quite a while, even to the United States Supreme Court.

Furthermore, the situation which the NLRB found in the case of the Western Union company is not likely to be duplicated in the telephone field, either with the Independent or the Bell companies. However, there is a lesson to be gained, not only from the Western Union experience, but from a number of cases decided by the NLRB. It is simply the lesson of how to avoid getting into trouble with the NLRB or with state labor relations boards in cases where the latter have jurisdiction.

This is not to suggest that the NLRB is always right. Indeed, it has been proven wrong by the U. S. Supreme Court on more than one occasion. But proving the NLRB wrong in court is an expensive business, even in cases where the issue at stake is large enough to justify such procedure.

So, therefore, if you are more disposed to avoid even the possibility of friction with, or intervention from, government labor regulators, here are a few of the rules, stated in popular language, which your correspondent has gathered from a reading of leading decisions of the NLRB which have either been upheld in the courts or not contested at all.

First of all, there is the National Labor Relations Act — the federal statute which gives organic existence and authority to the National Labor Relations Board. In a word, this act, popularly known as the Wagner Act, is supposed to assure employes of their right of collective bargaining and to prevent employers from interfering with that right by actions which can be classified as "unfair discrimination" against organized labor, its working members, or prospective members.

There is considerable dispute as to whether the Act does not also give employers the right to seek stability in their relationship with organized labor, particularly in the case of rival unions seeking exclusive bargaining rights. More recently there has been some question as to whether unorganized labor does not have some rights under the Wagner Act.

GENERALLY speaking, the NLRB has been disposed to resolve these disputed points against the interests of the employers and unorganized labor. Lately, the courts have been checking up on the NLRB and as a result of a congressional committee investigation of the House of Representatives, which is still in progress, it is generally expected that Congress will further modify the Wagner Act along these lines.

But the Wagner Act as now written is the federal law with which business must deal. The NLRB is the administrative bureau which has the authority, in the first instance, to enforce the Wagner Act. To date, most of the controversy over the Wagner Act has been in determining what constitutes an "unfair" labor practice. Reading of the act itself does not help very much in answering such questions, because the standards are expressed in such broad terms.

What can the employer company do with respect to labor unions under the act? Probably the most important right of the employer under the act is that it can refuse to give a union a closed shop. It can also refuse to give a union a "check-off," a device by which employer acts as a collecting agent for union dues by checking them out of the payroll before the employe members get their pay.

Again, there is nothing in the law that requires an employer in the first instance to grant wage increases or concede other working condition advantages simply because a union demands them. Nor is the employer obliged to sign a contract which contains such unacceptable conditions. Further than that, the employer is not obliged in the first instance to continue to bargain with an employe group after negotiations

have broken down because of such an impasse.

But these are bare legal rights which are counterbalanced by the right of the employes at all times to go out on strike in order to force acceptance of such demands, even though the employer insists that they are unacceptable.

Again, when such an impasse occurs, it is not the function of the NLRB to step in and say that either side is justified, although it is supposed to promote mediation. If mediation results in the signing of a contract, it then falls within the power of the NLRB to pass upon the validity of such a contract (if it is questioned) and determine whether its provisions are being lived up to.

Other than this, the NLRB's powers over a "struck" industry are very limited. Later on, after the strike has been settled one way or the other, the NLRB may come into the picture again on complaints of discrimination against strikers; and if it finds, to its own satisfaction, that workers have been discriminated against, or discharged because of union activities, it may order reinstatement, even with back pay.

Probably, the most important angle of the NLRB's job comes long before union activities have even progressed to the point of an organized strike. It comes during the time when union organization is going on within a plant, which is the period when the union (or rival unions) may be attempting to gather strength for a contest with the management or with each other. And this brings up the question of the so-called "company union" which is the point at issue in the Western Union case.

In enforcing what it calls the worker's right to independent collective bargaining with employers, the NLRB has taken the position that a union which is dominated by the management is no union at all under the Wagner Act. This is based on the theory that a union which is set up or helped financially by the management is likely to be more responsive to management than to the workers.

Before President Roosevelt appointed the relatively moderate William Morris Leiserson to replace ex-member Donald Wakefield Smith, the more radical majority of the NLRB appeared to be moving in the direction of this position: any union not affiliated with either the AFL or CIO is a company union unless conclusively proven to the contrary. Since the Wisconsin Telephone Co. case and several other decisions involving truly independent unions, the NLRB has been more tolerant of independent unions which are not affiliated with national groups.

Whether or not an ostensibly independent union is a "company union"—meaning one dominated by the management to such an extent as to be incapable of independent collective bargaining on behalf of the workers—is a question of fact. The NLRB decided such a question against the Western Union Telegraph Co. and it remains to be seen whether the courts will subscribe to that finding.

WHAT HAS been said above about the *rights* of employers should not be construed as a suggestion that employers should invariably stand on those rights. On the contrary, it may often be very practical and much less expensive to waive them. Better yet is the prophylactic type of labor relations policy which seeks to prevent any labor controversy from even getting started, rather than curing agitation which has already gained a foothold.

Here is a five-point program which your correspondent has worked out on the basis of decisive rulings already mentioned. These points are designed to keep labor trouble away from the business door rather than to fight an expensive battle with it after it has advanced beyond the threshold:

1. *Have a labor policy for the business.* Think it out, write it down, and use it. You know better than any outside expert what kind of a policy your business can afford which will fairly balance the interests of the workers and the management alike.

Once a policy has been decided upon, it should not be kept a secret from the workers. Knowledge and confidence on the part of the workers as to just where they stand discourage agitation. Furthermore, if the policy outlined won't bear repetition before employes, that's pretty good evidence that it might better be consigned to the wastebasket.

2. *Be open-minded about union membership.* The NLRB is very strict about this point. Any attempt to discourage union membership is looked upon as an unfair labor practice. Aside from what the law may require, there is a common sense angle as well.

Ordinarily, there is no good reason why a mere handful of employes in a small plant should have to join a union and pay toll to some outside leadership. The same situation might apply to larger plants, especially where the labor turnover is small and intimate personal contact of the management with the employes is on a long-standing and friendly basis.

Even as big an organization as Henry Ford's has had considerable success in preserving good labor relations from radical outside agitation by reminding workers of how cordial the relationship of the management with the worker committees has been in the past in the adjustment of all grievances, and how such inside committees can do a better job of representing the employes' point of view than outside union leadership which knows little or nothing of the problems peculiar to the business.

But if, in spite of such tactful and friendly observations, employes insist on joining a union, any indication of managerial displeasure is courting real trouble, according to the NLRB. In an actual case, one employer saved himself more trouble than he even realized by simply posting on the bulletin board a notice that went something like this:

"The management wants every employe to feel free to join any union he or she sees fit. The company is no more concerned about this than if our workers join the Elks, Masons, YMCA, or become vegetarians. We don't think union membership is at all necessary for our employes to get all the advantages that we can afford to give them, just as we have always done. But, on the other hand, such membership will not harm any worker in his relation to the management. The company's position is that our employes are paid for a job well done. After that they can spend their money for anything they please."

This may be smart psychology, as well as playing on the safe side of the National Labor Relations Act. Union organizers have always made great capital out of real or fancied opposition of the management to union membership. Under such circumstances, workers more easily yield to the suggestion that union membership would give them advantages which the management wants to keep from them—that the latter is holding out or has something to conceal.

When they are put on notice, however, that they can do as they please about the matter with no questions

asked and no hard feelings, they often realize that they are merely spending their own money on something they could easily do without. A street railway executive not long ago made a great hit with the workers when, in reply to a question as to whether there was an objection to the employes joining unions, he said: "Why should I? I didn't consult them before I joined my industrial association or my local board of trade, did I?" The workers appreciated the sporting attitude implied.

3. *Be willing to negotiate.* This does not mean recognition or granting closed shops, nor even the concession of any particular point of demand. It simply means standing ready at all times to receive politely any union delegation or workers' committee.

Indeed, putting off, or dealing untactfully with an "inside" shop committee may provide ammunition for union organizers which will eventually lead to dealing with "outside" committees, and they are invariably harder to deal with. A union attorney recently remarked that employers can always get much more reasonable reaction and concessions from a worker if the latter does not have to be continually defending his right to be talking to his own boss.

The problem of recognition, of course, is a delicate one which has to be handled with due consideration for all the factors in each case. It has happened all too often that the employer is caught in the middle between two rival organizations. About the best general plan to follow, where unions have actually organized a substantial number of workers, is to make an honest effort to find out which union represents the majority and to try and make a reasonable deal. Where such contracts are made in good faith, the NLRB has usually upheld them.

Trouble comes, however, in trying to play one union against a rival. The question as to whether a majority of unorganized workers can insist on voting "no union" at all in a bargaining election has yet to be finally settled. Finally, when an agreement has been reached, the management should not refuse to reduce it to writing and sign it. Such a refusal has led to grief before the NLRB.

Incidentally, it is well to be sure the union signs in proper form, because Congress is quite likely to amend the National Labor Relations Act in the near future so as to impose more responsibility on unions for carrying out their agreements.

WHY SOME MEN SEEM CLEVER

The greatest men are successful not because of genius but because of their capacity for serious study and hard work. The price of such success is never cheap but is definitely necessary, for success is never acquired without great effort, steadfast work, and continuous application.—EDGAR B. JESSUP, President, Marchant Calculating Machine Company.

4. *"Primary contacts" should be carefully controlled.* The "primary contact" between management and labor varies according to the type of business. In a factory it is the foreman. In a business office it is the chief clerk or an office manager. In a field force it may be a supervisor or division manager. But, in any event, the person who holds this post should be carefully selected because the NLRB invariably regards him as the representative of management.

His acts and his statements are looked upon as *prima facie* evidence of the management's policy direction. He is in a position analogous to the non-commissioned officer in the army who functions as a liaison between the officers and the ranks. Shop foremen have even been called "sergeants of industry" in labor literature.

Whether a special full-time expert should be hired to handle labor relations exclusively is another managerial decision which depends upon the particular situation. In a large organization it has generally proven wise to have a universally respected, qualified employe, who has been trained from the "inside" to handle labor matters. In such cases it is not enough to give him a separate office and title. Employes must feel that the management backs him up as well and is not merely trying to delegate its labor relations problem without delegating any responsibility for handling it.

5. *Be reasonably consistent in negotiations.* Where employe grievances have reached the stage of negotiation or attempted negotiation, the preponderance of real trouble has resulted from misunderstanding as to who said what. Of course, both sides may feel it advisable to change their positions during the course of the negotiations by conceding a point here or there. That is the very purpose of negotiations. But shifting demands and inconsistent attitude during the course of negotiations invariably lead to charges of "double-crossing" or "reneging" and outright questioning of personal veracity.

Even a casual examination of typical troubles which have come all the way to Washington for settlement, indicate that the safest course for management to follow is to preserve the same temper throughout the negotiations, regardless of how erratic the other side may act, to reduce management's own demands to a written program with important points enumerated and simply stated. Again, the management's interests throughout the negotiations should be entrusted either to one official or a small harmonious committee with an acknowledged head.

Then the position of management will be clearly understood and as points are conceded, there will be a record of exactly who said what, which will stand up against any attempt to confuse the issues.

It may be that after receiving the proposals of the employes, counter-proposals are desirable so as to form the basis of negotiations. Using that approach, the progress of negotiations can be charted from that point on. The important thing is to have everything clearly understood and avoid crossed wires.

Obviously, a declaration by the management before negotiations open that it would refuse to sign an agreement, even if reached, torpedos them from the start and invites serious labor trouble. Even if the initial employe demands seem so preposterous as to make negotiation appear hopeless, the experience recorded in NLRB files indicates that it is always the better part of wisdom to make some sort of a counter-proposal and get negotiations open, if at all possible.

Negotiation is the lance which opens up the employes' grievances and makes them subject to exploration and cure. To suppress these grievances by failure to negotiate too often leads to festering underneath which may subsequently break out into a serious labor infection. Of course, there have been cases where a flat-footed "no" from the front office has meant the end of an incipient labor dispute, but it's taking a chance. It's just like bandaging up a dirty wound with the hope that it will cure itself.

"Wy
Aud
fr
ELEPHONE CO.

Wy do we go to
upmatic Electric
fr supplies?"

"WELL, take this drop wire for instance. It's called Monotype, and uses Copperweld wire. It has a steel core welded to a thick copper covering, and will stand a terrific strain. That means when I once put it up, it stays up, and I don't have to go back in a few months to do the job over.

"Even their smallest items are always highest quality. When the job is done, we never get customer complaints on performance, because every Automatic Electric product is designed for a particular job and for telephone use only.

"Our superintendent used to buy tools wherever he could get them cheapest. Now he gets them through the Automatic Electric supply service, too—well known products such as Klein pliers, Estwing hammers and so forth. He says he saves several times their cost every year in reduced breakage and better workmanship. I certainly agree with him 100%."

Perhaps you could save money by checking into your supply situation and finding out if your supplies are: 1st. designed exclusively for telephone use; 2nd. highest grade products of well known manufacturers; and 3rd. shipped to you swiftly, carefully packed and at uniformly low prices. Automatic Electric's supply service unfailingly meets all three of these important qualifications. Will you try us with an order?

AUTOMATIC ELECTRIC

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

Distributors in U. S. and Possessions:
AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 W. Van Buren St., Chicago, U. S. A.
Export Distributors: AUTOMATIC ELECTRIC SALES COMPANY, LIMITED

FATHERS AND SONS

ANOTHER father and son team in the Independent telephone industry is **H. A. PRICE,** secretary-treasurer and manager of the Markesan (Wis.) Telephone Co. and secretary and manager of the Grand River (Wis.) Telephone Co., and **WINSTON H.,** accountant and vice-president of the Markesan company.

H. A. PRICE, originally "a schoolmaster," was born in Dansville, N. Y., August 20, 1871. Following the moving of his home to Wisconsin he attended the Oshkosh Teacher's College and later graduated from the Superior State Teacher's College. Entering the educational field he taught for ten years in the rural, grade and high schools of Green Lake County, Wis.

On July 1, 1905, he transferred his activities from educational training to the telephone industry by purchasing the Markesan Telephone Co. Until the company was incorporated on May 1, 1922, Mr. Price was the sole owner. Since the incorporation he has been its secretary-treasurer and manager.

Through activities in association work he has become well known among Wisconsin telephone men. He was one of the organizers of the Wisconsin State Telephone Association and for a number of years was a director of the organization. He was president of the association for one term, from 1923 to 1924.

In 1931 Mr. Price assisted in organizing the Wisconsin Locally Owned Telephone Group, and was its secretary for five years. Since 1931 he has been the group's legislative representative.

Aside from the development of his company and association activities, Mr. Price has maintained active memberships in Masonic orders, Eastern Star, Modern Woodmen and Mystic Workers.

WINSTON H. PRICE, is a native Wisconsonite. He was born in Markesan, March 26, 1907. After obtaining his early education in the grade and high schools of Markesan he entered the Oshkosh Business College. In 1926 he was employed as bookkeeper for a hosiery company operating in Waupun, Wis.

On February 27, 1927, he renewed the acquaintance made with telephone work during summer vacations by returning to the industry as bookkeeper for the Markesan company. In 1937, after ten years of service, he was elected vice-president of the company.

Well known among Wisconsin telephone men is this father and son team composed of H. A. PRICE (right) secretary-treasurer and manager of the Markesan Telephone Co. and secretary and manager of the Grand River Telephone Co., and his son (left) WINSTON H. PRICE, accountant and vice-president of the Markesan company.

Like his father, he is interested in association work. At the present time he is a member of the Wisconsin State Telephone Association's committee on property retirement units for Class C and D companies.

In addition to telephone activities the junior Mr. Price also owns and operates a general insurance agency, is secretary of the Markesan Business Men's Club and secretary of the fire department. His fraternal memberships include the Masons, Eastern Star and Modern Woodmen. He devotes his spare time to two popular hobbies—golf and fishing.

▼ ▼

ALTHOUGH admittedly allergic to balance sheets **CHARLES E. WELLS,** president of the Northwest Telephone Co., Hillsboro, Ore., and well known president of the Oregon Independent Telephone Association, likes the telephone business and is proud that his wife and two of his sons are actively associated with his company. His wife, **ANNA MARSH WELLS,** is vice-president and auditor; **GAIL W. WELLS** is superintendent of the Sheridan district, and, **THEODORE J. WELLS** is district superintendent and manager of the exchanges in Redmond and Sisters.

MRS. CHAS. E. WELLS—born in Nevada, Iowa, and graduated from the high school in Boone—in 1897 commenced her telephone career with the Boone County Telephone Co. as operator and bookkeeper. Since then her work has closely followed her husband's and in the 42 years that have slipped away she has efficiently served six telephone companies.

Mrs. Wells was cashier and auditor of the Southwest Telephone Co.,

HERE IS THE TWENTIETH article in a series introducing tomorrow's potential leaders to one another and to the field in general. Material for this feature will be welcome.

in the Independent telephone industry

Although rearing a large family is a full-size job, MRS. CHAS. E. WELLS of Hillsboro, Ore., has found time and energy to devote to the telephone business and at present is vice-president and auditor of the Northwest Telephone Co.

With his parents both setting a good telephone example, THEODORE J. WELLS has successfully learned the business until today he is district superintendent and manager of the Redmond and Sisters, Ore., exchanges of the Northwest Telephone Co.

CHAS. E. WELLS, president of the Northwest Telephone Co., Hillsboro, Ore., was an early pioneer in the Independent telephone field. He has been active in state association work and at present is president of the Oregon association.

Marion, Kans., from 1899 to 1906, the Gulf Coast Telephone Co., Kingsville, Texas, 1906 to 1912, Falfurrias (Tex.) Telephone Co., 1912 to 1914. In 1914 her husband sold his Texas properties and the family moved to Hillsboro, Ore.

In Oregon she continued her relationship with the telephone business and from 1914 to 1929 was cashier, secretary and operator for the Hillsboro company. In 1929, following the company's expansion, she became vice-president and auditor of the newly-formed Northwest Telephone Co., Hillsboro.

Mrs. Wells has successfully reared a large family of ten (including three step-children), and as they grew to manhood and womanhood she was able to devote more and more time to her interest in telephone work as well as to become active in fraternal and educational fields.

For 20 years she has been a director of the Hillsboro public schools. At the present time she is president of the city council and is chairman of its water and power committee, and of its traffic committee. She is also an active member of many national and state women's organizations.

Despite her business and family obligations, and her civic and social connections, Mrs. Wells finds time for golf, fishing and photography as a means of relaxation.

GAIL W. WELLS, was born in Boone, Iowa, June 25, 1896. He was educated in the grade and high schools in Kingsville, Corpus Christi and Falfurrias, Tex., and attended the Brooklyn (N. Y.) Navy Electrical School. Then he went to Panama in the submarine service. In 1917 he enlisted in the navy submarine service for the war and in 1919 was discharged with an honorable chief electrician's rating.

Mr. Wells grew up in a telephone atmosphere, operating switchboards while in grade school, and helping on lines during summer vacations. In view of his early connection with the industry he entered his father's company after the World War and has advanced to the position of superintendent of Sheridan district.

He is president of the Sheridan Rotary Club, a past master of the Masonic lodge and belongs to the American Legion. He is now serving his second term on the Sheridan city council. Mr. Wells was married in 1916 and has one son who is now helping in telephone work. Thus one of the third generation of the

Wells family is preparing for his life work.

THEODORE JUSTIN WELLS was born in Marion, Kans., September 10, 1905. He was educated in public schools in Texas and the Hillsboro high school. His first telephone experience dates back to the summers of 1919, 1920 and 1921 when he worked with construction crews of the Hillsboro company. In 1925 he became assistant manager and lineman of the Sheridan-Willamina Telephone Co. and in 1928 manager of the Deschutes Mutual Telephone Co., Redmond, Ore.

After the formation of the Northwest company he was made district superintendent and manager of the Redmond and Sisters exchanges and is in that capacity at present.

Mr. Wells is a member of the Kiwanis Club, Chamber of Commerce, the Redmond city council and the board of directors of the Oregon Independent Telephone Association. Like many telephone men the sports of hunting and fishing are foremost among his "away from business hobbies"; although his two sons, Richard Donald and Theodore Jr., also occupy considerable of that time.

CHARLES EUGENE WELLS, president of the Northwest company and also president of the Oregon association, was born in Corry, Pa., October 31, 1861, and was educated in the grade and high schools of Chicago, Ill. His telephone experience goes back to 1895, shortly following the expiration of the original Bell patents. At that time he was telegraph operator and city agent for the Milwaukee Railroad in Boone, Iowa, and his telegraph work directed his attention and interest to the telephone field.

"Having sold a house and a lot for $1,500," said Mr. Wells in commenting on his entrance into the industry, "I had what seemed to me like a considerable portion of all the money then in circulation and decided to expend it in building an Independent telephone plant. In those days no one but the Bell folks knew how much it cost to build a telephone plant—and they wouldn't tell."

The Boone County Telephone Co. was formed in 1895 with $10,000 capital. The original stockholders were leading citizens of Boone—W. A. Crooks, Dr. A. A. Deering (father of Chas. C. Deering, secretary-treasurer of the United States Independent Telephone Association and secretary-treasurer of Iowa association), two bankers, and "several others who knew their way around."

In describing the early development of the company he said: "We decided to start construction when we had 100 subscribers signed and had a tough job getting the 100. Plutocrats only were deemed to rate telephones in those days."

Young Chas. C. Deering returned from an electrical engineering course about 1897 or 1898 and went to work with Mr. Wells. "I recall," says the latter, "that he and I formed a partnership to do odd jobs of electric wiring to help supplement our salaries of about $75 each. Don't laugh; each of those dollars would buy more ham than three of the subdivided tokens of this more abundant era. And we had to work only 10 or 12 hours a day—the rest of the time was our own."

In 1898 the Boone exchange had grown to 35 subscribers and toll lines were built to connect with the Des Moines Mutual and the Marshalltown telephone companies. The Northwestern railroad yards were crossed with a lead of 60-foot poles with eight ten-pin crossarms above the Western Union and the Bell leads, and it proved insufficient to serve the north side. The problem of "what to do" came to the front as lead-covered cable was then scarce as well as costly.

"Of this need," says Mr. Wells, "was born the invention of our 'selective' cable. Specifications: 50 cotton-covered annunciator wires (not pairs) wrapped with two servings of friction tape and, to make sure that no moisture would get in or out, painted with two coats of asphaltum.

"For a while we got anyone we wanted on the north side when we rang them. Later we got everybody whether we wanted them or not. The operator then calmly selected the party wanted by name from the chorus of 'hellos.' Simple, wasn't it?"

In 1899 Mr. Wells sold his interest in the Boone County company and located in Marion, Kans. In the following seven years he built exchanges in Marion, Peabody, Florence and Burns, Kans. During four years of this period he was secretary of the Kansas Independent Telephone Association. In these years Barbour and Brailey and the Heim interests built the Home plant in Kansas City, Mr. Wells recalls.

"Our company," he says, "joined with Brown of Abilene and Champlin of Newton in the construction of a copper metallic toll circuit from Topeka to Wichita — which was shortly disrupted by purchase of one of the companies by the Bell company. This, I think, was the first Independent toll circuit of any length in Kansas."

The years from 1900 to 1910 were a period of rapid development of rural mutual companies in Kansas. Threat of their competition was such that Mr. Wells sold his plant to the Missouri & Kansas Bell company in 1907 and moved to Kingsville, Tex., then a town of 700 population; now one of 7,000. From 1907 to 1913 he built exchanges in Kingsville, Alice, and Falfurrias, and also purchased and later sold the Brownsville exchange.

Unfortunately poor health due to inability to become acclimated to the water and the warm climate compelled the renunciation of an excellent business and he sold his Texas properties in 1913.

The next "trek" was to Oregon in 1914 where Mr. Wells built the family's present home in Hillsboro, and also purchased the Hillsboro Telephone Co. In Hillsboro "the tribe has grown to manhood and womanhood without the loss of a member" and its members are firm believers that "where rolls the Oregon is the place to live."

The Hillsboro company has progressed under Mr. Wells' management and now consists of five exchanges which serve 1,000 telephones over 250 miles of pole lines. In addition to developing telephone companies he has also been interested in the work of his state telephone associations.

He is a charter member of the Iowa association and former secretary of the Kansas association. At the present time he is president of the Oregon Independent Telephone Association (he assisted in its organization in 1915). "That," says Mr. Wells, "doesn't mean much as Les Gritten, our efficient secretary, does all the work."

He is also a member of the Masons and is proud to be among the few who have been members for 50 years. His chief hobby is golf although he says that he only "plays at golf."

▼ ▼

Bell System Residence and Business Telephones

Home telephones make up about three-fifths of all telephones in the nation-wide Bell System. In the 25 years prior to 1939 the telephones in residences increased from 3,050,000 to about 9,550,000, and those used for business purposes from 2,157,000 to about 6,200,000.

In this thatched hut is located the telephone office at Bon Toc, Philippine Islands. The kinky pole on right supports the telephone wires. Harry Wilson of Columbus, Ohio, plant man for the Ohio Bell, received this photograph from his son, Sergeant Charles F. Wilson, of the Islands' observation squadron.

Here and There in the Field

HANDICAPPED?

BY YE OLDE OBSERVER

Not far from the office where I hang up my hat, there is a school for children who are handicapped by physical deformities of every possible kind. Twisted arms, legs, backs, shrivelled bodies, wheelchair cases and crutches are common; yet, facing life under such severe handicaps, are found happy smiling faces, and shrieks of delight are heard as these children play softball at noontime and recess.

If we, who have normal physical bodies and are blessed with children having sound, healthy bodies, would only count our blessings, we would stop grumbling and be more appreciative. Who knows but what some of these children may be great artists, composers, musicians, authors or may carve a place for themselves in history to come? In the meantime, they are carrying on day by day, educating themselves to face life's problems of tomorrow. Handicapped? Yes, but they "Keep Sweet":

Keep Sweet

Don't be foolish and get sour when things don't come your way;
Don't you be a pampered baby and declare, "Now I won't play."
Just go grinning on and bear it.
Have you heartache? Millions share it,
If you earn a crown, you'll wear it.
Keep Sweet.

Don't go handing out your trouble to your busy fellowmen;
If you whine around they'll try to keep from meeting you again.
Don't declare the world's "agin" you,
Don't let pessimism win you.
Prove there's lot of good stuff in you.
Keep Sweet.

If your dearest hopes seem blighted and despair looms into view,
Set your jaw and whisper grimly: "Though they're false, yet I'll be true."
Never let your heart grow bitter.
With your lips to Hope's transmitter,
Hear Love's songbirds bravely twitter,
"Keep Sweet."

Bless your heart, this world's a good one, and will always help a man.
Hate, suspicion and malice have no place in Nature's plan.
Help your brother there who's sighing,
Keep his flag of courage flying.
Help him try—'twill keep you trying—
Keep Sweet.

—Author Unknown.

▼ ▼

Cartooned Animals Used in Directory Bill Inserts

BY HARRY PADGETT

HOW CAN the most advantage be obtained from mailing pieces? If any advertising man had the solution to that, his future would be assured. But Ralph Burgess, general directory manager of the Mountain States Telephone & Telegraph Co., Denver, Colo., has found one efficient way to emphasize directory advertising.

His plan is to use a series of inserts mailed to subscribers with the monthly statements. Each series is different, and carries a particular appeal of its own. Some comments on these are to the effect that they are "very good," others say they are "kid stuff"—but the main point is—they are remembered.

Currently running, a set of six clever little animal figures are being mailed out. Each has a slightly different message about the particular animal, and all stress the ease and convenience of using the classified directory as a shopping aid.

"Are Beavers Smart? They work furiously to get things you can get with no work at all!" states the die-cut folder of the beaver. "You can be 'Busy as a Beaver' if you go around town in person to obtain goods and services you need. But it's no work at all to locate them in the classified section of your telephone directory. . . ."

In the series previous to the current set, a survey was made by J. M. Wilson, assistant to Mr. Burgess. While it must be recognized that the inserts are asking a very intangible thing—that subscribers refer to the classified directory—an indication of the effect they have on subscribers would be indicated by a remembrance of the inserts received, the general description of them, and how much is remembered of the message carried.

In carrying out the survey, the interviewees were asked if they remembered receiving them, what they were like, and what the written message was about. It was very gratifying to learn

A series of clever animal inserts, in attractive colors, are being mailed out to subscribers by the Mountain States Telephone & Telegraph Co. to emphasize directory advertising. The cartooned animals have caught the fancy of subscribers' children who want the message, printed inside, read to them like the newspaper "Funnies." Subscribers do not discard the animal inserts but use them for decorations in the breakfast nook, in the nursery and elsewhere around the home.

that *45 per cent of those interviewed had "gotten the idea."*

Not all the subscribers in the Mountain States territory are mailed these folders. As they are a direct appeal to use the classified, they are sent only to those whose directory has the classified section—about 90 per cent of the total number of subscribers in that territory, or approximately 500,000.

These inserts themselves are masterpieces of goodwill. The cartooned animals, eye-catching and humorous, are so made that they can be spread at the sides, and stand erect. They proved an immediate favorite with the children, and their message had about as much chance of being missed as the Sunday "Funnies," for the parents had to read the message to the children, and then explain its intentions.

The copy inside the folders was purposely created for the dual purpose of telling something about the animals, and to "tie-in" the animal story with the directory feature.

Sol Fingerman, whose work in illustrating the classified directory has created much favorable comment, created the cartoons of animals. They are entirely different from his usual style, and this very difference is one of the attractive features of the set. Usually the figures have been more sophisticated, with an appeal to older persons.

Imagine then the thoughts of telephone company officials when they discovered that in various homes the figures of these cartoons had been cut out and used for decorations on bars, in the breakfast nook, and in the nursery! They were not as surprised as they might have been, for many requests were received for extra copies and even to include two or more in the monthly billing.

"I Wonder Why" of a Telephone Engineer

BY RAY BLAIN

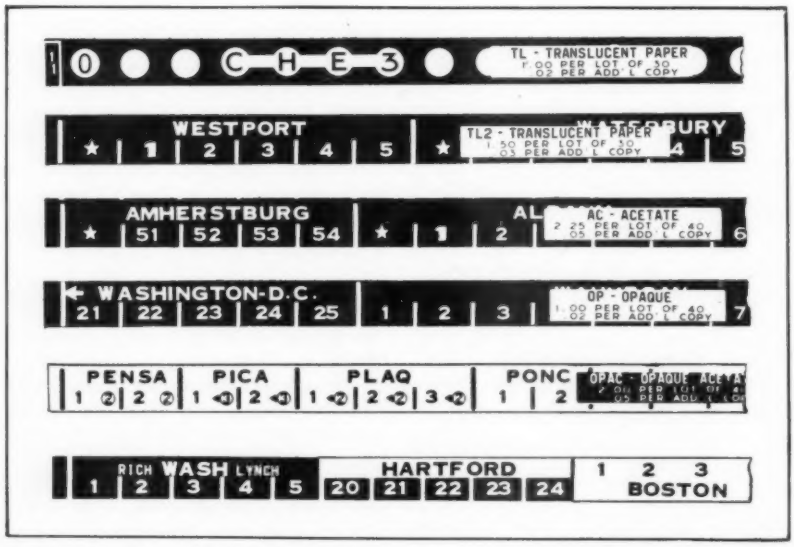
"I Wonder Why" Independent telephone companies do not make a greater effort to provide suitable designation strips for all their switchboards.

Proper designation strips not only present a much better appearance on local, rural, or toll switchboards but they also increase the efficiency of the operators in general. While it is true that makeshift designation strips may be provided (and they usually are) making them is not an easy task and it does not prove economical when one considers the present-day extremely low cost of approved type strips.

It sounds quite simple when we think of drawing a designation strip but when one actually starts to lay one out it never proves so easy; and as a rule homemade strips never fit right or make a neat appearance.

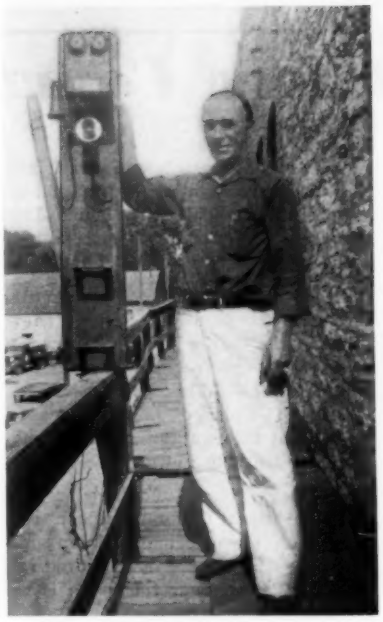
Due to the usual lack of designation strips, many resort to the practice of painting in various colors, around the jacks, symbols representing different classes of service. This paint in turn frequently enters the jacks and causes no end of trouble. To our mind there is nothing quite so sloppy around any telephone exchange as a multiple painted up like a wild Indian on the war path.

An ordinary opaque strip costs only



Proper designation strips for switchboards provide a better appearance as well as increasing efficiency of the operators.

STILL IN USE



This old style Eureka wall type telephone is still in use after more than 43 years of constant service. It is owned by a banker at Austinville, Iowa, and was originally installed by the old Corn Belt Telephone Co. of Waterloo, Iowa. The instrument was recently brought for repairs to BEN HALL, manager at Greene, Iowa, for the Iowa State Telephone Co. He is standing beside the telephone. The only parts in the instrument that have been changed are the receiver and transmitter. Mr. Hall sends out a challenge to telephone men: "If anyone can beat this record for a telephone still in service, I would like to see it."

about one dollar in lots of 40, and that number will easily outlast the ordinary switchboard. Without any increase in cost the background of the strip may be made white, black, red, yellow, green, blue or brown or any combination thereof. Colored letters on black may also be obtained. One order may consist of one or more strips of any or all colors and can be used to meet practically any service condition.

Manufactured designation strips are printed on heavy stock paper, or on the new cellulose acetate and translucent paper suitable for use on lamp-indicating types of designation strips. Lamp indicators are now often used on rural and toll lines to indicate when they are busy.

All of these designation strips are accurately cut to size and easily installed in any strip holder. This is a cheap, worthwhile improvement that any Independent manager can make in his particular exchange.

The Operators' Corner

By MAYME WORKMAN

Traffic Supervisor, The Illinois Telephone Association, Springfield, Ill.

HANDLING unusual requests that endanger a company's policy and standards. No. 384

IN EVERY line of business, customers occasionally request a service or a special privilege which the company is not in a position to grant. This condition is particularly applicable to the traffic department of a telephone company. For example, a customer may request that the name of the calling party or calling place be withheld from the called party. The operator would have to tell the calling party that she cannot handle the call as requested.

Another request the company cannot grant is that information which is obviously untrue be given to the called station—for example, that a wrong calling place is calling. The operator would have to tell the calling party that she cannot accept the call under such conditions.

Suppose the calling party, in placing a long distance call, requests that information as to the nature of the intended conversation be given to the called party—for example, he may request that the called party be asked to bring certain papers to the telephone or that the called party be prepared to furnish specific information, to render a decision on a certain matter or on a call on which a called party's name has been specified, or that he be prepared to talk about a given subject.

The operator would have to explain to the calling party that information of this nature cannot be given to or secured from the called station or party. After making the necessary explanation, the operator would try to obtain the calling party's consent to complete the call in the usual way.

Question No. 4 comes under the category of conditions outlined in the foregoing. The operator should explain that she will be unable to handle the calling party's call in the manner requested. If he desires further information or explanation, the operator will, of course, refer the call to her supervisor or chief operator. A feasible explanation would be that "the telephone company, in including the name of the calling place in announcing a long distance call, has established a precedent and, if the company should deviate from this practice in a certain specific case, they could be accused of fraud or collusion in collaborating with the calling party in withholding information ordinarily volunteered.

"Of course, all requests of this nature might not come under this classification but the telephone company has no way of distinguishing between the two classes; therefore, it would be dangerous and impractical to take this risk." If the calling party is still not satisfied, the supervisor would refer him to the manager or chief executive in charge of the office.

To illustrate a condition in which the telephone company might be involved by granting the request outlined in question No. 4, if a criminal or fugitive from justice should make this request and it were granted, serious complications might result as the telephone company would be placed in a position of aiding or abetting a criminal.

Questions from Illinois Operators

1. When should you register a call in taking peg count?
2. If "Nfy 3 mins." is entered in the "Spec. Inst." space, and the notification is made as requested, what action should be taken?
3. On a 10-cent and 15-cent collect call where they "talk to anyone," how long are they allowed to converse before you start charging overtime, three minutes or five minutes?
4. When a party places a call from a pay station and requests that the operator will not announce the calling place when the called number answers, is the operator allowed to do so? If not, how do you explain this to the party making the request?
5. Should toll center, in timing a pay station call from a checking station, notify when the initial period has elapsed?

The answers to these traffic questions are presented on page 33.

Race Information Wire

Services Before Court

HORSE racing bookies fight for right to operate with aid of telephone and telegraph services in Chicago.

HIGHLIGHTS of the week's action of the federal-state drive in Chicago to force Moe Annenberg's racing information organization—charged with violation of federal laws covering lotteries—out of business through a suspension of telephone and telegraph services included: The agreements of the Illinois Bell Telephone Co., the American Telephone & Telegraph Co., and the Western Union Telegraph Co. to discontinue service to Annenberg's racing news bureaus, and the attack of Annenberg's attorneys on the validity of the lottery indictment in federal court which was the basis for the federal-state demand for suspension of the utilities service.

The injunction activities caused a three-day reprieve for Annenberg from plans of the Illinois Bell to discontinue service at noon on November 6. Federal Judge Wilkerson on November 8 issued a restraining order against the discontinuance of wire services by the A. T. & T. and Western Union on November 9. He will hear further argument on a temporary injunction November 15. The Illinois Bell discontinuance of service, which by agreement on November 6 was extended to November 9, was not included in Judge Wilkerson's order.

Following receipt of a demand (TELEPHONY, November 4, page 29) that wire service to the Annenberg interests be discontinued, the Illinois Bell Telephone Co. and the American Telephone & Telegraph Co. announced on November 2 that they would cut off all service to Annenberg's horse racing information concerns. The Illinois Bell's discontinuation was scheduled for noon November 6, and that of A. T. & T. Co. for November 9.

The reply of the Illinois Bell company, signed by A. H. Mellinger, president, to the demand that its service be discontinued to Annenberg's organizations, was addressed jointly to the prosecutors. It read:

Your joint letter dated November 1, 1939, addressed to me as president of the Illinois Bell Telephone Co., in which you state that you have evidence in your possession that telephone service furnished by this company to Moses L. Annenberg, Nationwide News Service, Inc., and Illinois Nationwide News Service, Inc., is being used in violation of federal and state law, is received.

In conformity with the notification and request contained in your letter we are this day giving notice to Moses L. Annenberg, Nationwide News Service, Inc., and Illinois Nationwide News Service, Inc., that on Monday, November 6, 1939, at 12 o'clock noon, the Illinois Bell Telephone Co. will discontinue furnishing telephone service to them under their respective contracts.

Your letter also refers to "any other related or affiliated corporation, or any other corporation, individual, or enterprise which is now engaged, or hereafter may be engaged, in similar activity." As explained at our conference on Saturday, October 28, 1939, with William J. Campbell, United States attorney for the northern district of Illinois, and his associates, we must look to law-enforcing agencies to advise us of evidence of violation of federal and state law to be used as a basis for denying telephone service, for we cannot undertake to act as a policing agency, or to censor telephone service, which, under federal and state law, we have no right to do.

If at any time evidence comes to the attention of either of you that telephone service is being used by such other corporations or individuals for illegal purposes in respect to bookmaking and gambling, we will undertake to comply with requests you may make in relation to the denial or withholding of telephone service to such corporations or individuals, in conformity with our present practice."

The A. T. & T. Co.'s announcement was made in less formal terms. Officials merely said they would comply with the prosecutors' wishes.

On November 6 the federal and state courts were asked to enjoin telephone and telegraph companies from halting service to the two racing news concerns. The suits also asked that William J. Campbell, federal district attorney, and State's Attorney Courtney be restrained from threatening the telephone and telegraph companies with indictment for continuing their service to the racing news concerns.

The suits contended that on November 1 the state's attorney and the federal district attorney sent a joint letter to the Illinois Bell Telephone Co. and the American Telephone & Telegraph Co. warning them that criminal proceedings would be instituted unless they discontinued serving the Annenberg concerns.

The suits also contend that sending race information over the wires is not a violation of the state or federal laws. They state that similar information has been sent over the wires since 1904 and that the federal lottery laws have been on the books since 1872 and 1895.

According to the complaints the Delaware corporation gathers news from all the tracks in the country and sends it to several subsidiaries and press services. The afternoon newspapers in Chicago and newspapers throughout the country are among the purchasers of the news, it was stated.

Attorneys for Annenberg argued that the Federal Communications Commission in an informal opinion published a year ago held that sending racing information over the wires is not a violation of federal laws.

Federal Judge James H. Wilkerson proposed that service by the utilities remain in status quo until he disposes of the injunction proceedings. Kenneth F. Burgess, counsel for the Illinois Bell agreed, and Mr. Campbell did not object. The agreement was reached just 35 minutes before the Illinois Bell company was scheduled to have suspended service on November 6.

Hammond E. Chaffetz, counsel for Annenberg, presented the arguments on the petition for injunction. Mr. Chaffetz emphasized that the Nationwide services are engaged only in the distribution of news.

"The demand on the utilities," he stated, "is based solely on the contention that handbook betting is a lottery and that the Annenberg companies are operating in furtherance of a lottery. If this interpretation is wrong, irreparable harm would be done both to the Annenberg companies and the utilities."

Counsel for the Annenberg interests, before the federal court hearing, filed similar injunction proceedings in the Cook County Superior Court against the Illinois Bell Telephone Co. Judge Donald S. McKinlay continued the hearing pending action before Federal Judge Wilkerson. The action in the state court was taken as a precaution in case the federal court held that it had no jurisdiction over Illinois Bell or State's Attorney Courtney.

Annenberg's attorneys said they would file still another suit in federal court against the Western Union Telegraph Co., Mr. Campbell, and Mr. Courtney.

Meter Equipment Studied

In Washington Rate Case

CHIEF developments in the hearings being conducted by the Washington Department of Public Service on rate changes proposed for the state of Washington by The Pacific Telephone & Telegraph Co. during the period October 28 - November 3, concerned testing of meter equipment proposed by the company for installation in Seattle and the appointment of Cyrus G. Hill, former FCC engineer in the investigation of the telephone industry as an aid to King county in its opposition to the rate changes.

Testimony was given during the week by Garrison Babcock, the county's chief consulting engineer and F. D. Tellwright, chief engineer, and I. F. Dix, vice-president and general manager of the Pacific company.

On October 28, the hearing was adjourned to the testing laboratory of Engineering Hall on the University of Washington campus. Associate Professor Austin V. Eastman of the School of Electrical Engineering, aided by Garrison Babcock, telephone engineer retained by Prosecutor B. Gray Warner, who is fighting the meter system, tested the meter equipment.

Their experiments seemingly showed that a call can be placed over a metered telephone without registering. The experiments also tended to show that when a telephone meter is oiled it will register 13 calls when only ten have been placed. Telephone company officials countered this point by stating that the equipment is never oiled.

Tests also indicated that line and construction crews using portable handsets could register a charge for the call on the meter of some householder. Officials of the company stated that linemen never call anyone except the company.

Cyrus G. Hill consulting engineer who was employed by the Federal Communications Commission in its investigation of the telephone industry will aid King county in its fight against the proposed changes in rate structure, Prosecutor B. Gray Warner announced on October 30.

Mr. Warner, said Mr. Hill, will help the county in the cross-examination of telephone company witnesses who previously have testified about the activities of the Western Electric Co.

Garrison Babcock was cross-examined on October 31 by Otto B. Rupp, counsel for The Pacific Telephone & Telegraph Co., on the metered-service test presented by the county at the University of Washington.

Besides six conditions under which the county sought to show the telephone company's meters would register calls inaccurately, Mr. Babcock said he "didn't mention at the test certain other contingencies which could cause inaccuracies in the meters."

He testified that when county engineers visited the telephone company's central offices a month ago to test some of the metered service now being used in Seattle, it was discovered that faulty wiring resulted in one party's calls being registered on another subscriber's meter, and that the second subscriber's calls were registering on the original party's meter. Although this error was not shown in the county's test, it was another complaint of "inaccuracy" which might occur, Mr. Babcock said.

S. B. Williams, engineer with the Bell Telephone Laboratories, Inc., New York City, as a rebuttal witness, testified that although irregularities shown by Mr. Babcock could occur, they are rare. He asserted that only once in 187 years on one subscriber's telephone would a poor contact in a telephone instrument cause inaccuracies in registering calls.

F. D. Tellwright, chief engineer of the Pacific telephone company, on November 1, gave lengthy and highly technical testimony on the cost of reproducing the company's equipment and holdings in Washington. He explained engineering costs the company has encountered and added that the reproduction also would have to include expenses for a marketing survey to determine classification and types of telephone services to be installed.

I. F. Dix, vice president-general manager of the Pacific company, testified at the hearing on November 2. He stated that a decrease of approximately 31,000,000 calls is expected in Seattle in the next year if the proposed metered service is installed.

Asked if this would not mean about 250 less calls each year by each subscriber, Mr. Dix said he believed that estimate was "probably right." He indicated that the reason for the expected decrease is that patrons would cut down their telephone use in order to avoid paying extra charges under the meter system.

Mr. Dix testified previously that addi-

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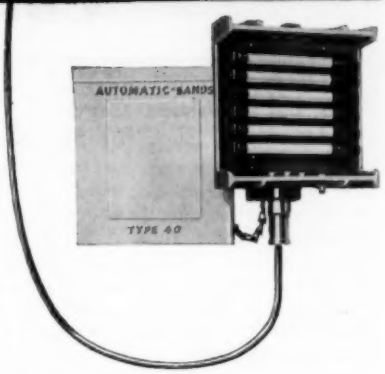

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tional employes required in the operation of the proposed metered service in Seattle would cost the company approximately $46,000 annually. He said further, however, that compensating decreases in other lines also are expected under the metered system.

S. B. Williams testified that if 35,000 metered telephones were installed in Seattle, there is a possibility that a total of 11 calls a day could be registered improperly on meters other than those from which the calls originated.

Ninety-five per cent of Pacific company property in Seattle is devoted to the operation of city exchange service, R. W. Mastick, the company's general staff engineer, testified on November 3. The remaining 5 per cent of the property is devoted to long distance calls. Through the witness, the company introduced 50 exhibits showing the division of telephone property for rate-making purposes.

Commission and Court Activities

Trips on Telephone Cord; Sues for $25,000

An injury alleged to have been sustained when she tripped over a telephone cord, subsequently necessitating amputation of her right leg, was the basis of a $25,000 damage suit filed in the Cook County Circuit Court November 4 against the Illinois Bell Telephone Co. by Mrs. Kathryn Larson, Evanston, Ill., wife of an insurance salesman.

The suit contends that the cord in her home was of "undue length" and lay on the floor.

▼ ▼

Minnesota Commission Defends St. Paul Rate Order

The Minnesota Railroad & Warehouse Commission on October 20, filed its answer in Ramsey County District Court to the city of St. Paul's intervention in a subscriber suit attacking the compromise rate order which raised rates previously ordered for the St. Paul area. The commission contended that it acted within its rights and did its duty on May 2 when it issued a compromise order to the Tri-State Telephone & Telegraph Co.

The commission summed up its answer in three points, namely: That the city knew the material facts of the compromise order and should have objected right away if it planned to object; that the Ramsey County District Court has no jurisdiction in the case; and that the original 25 per cent reduction ordered in that court was based on 1933 data but was not approved by the state supreme court until 1939 and conditions had changed in the intervening six years.

The commission's answer agreed with that of the city of Minneapolis which had previously asked that the compromise order be allowed to stand. Originally the Ramsey County District Court had ordered a 25 per cent retroactive rate reduction for St. Paul subscribers. The state supreme court sustained this decision. The compromise order of May 2, cut the reduction from 25 per cent to 12 per cent and included Minneapolis where a rate investigation was under way.

▼ ▼

Discharged Employe Asks Rehearing on Pension Rights

Attorneys for Miss Marjorie Twiss, former employe at the Louisville exchange of the Lincoln (Neb.) Telephone & Telegraph Co., have asked the Nebraska Supreme Court for a rehearing of the case in which that tribunal reversed a $5,000 judgment based on a charge that the area manager had falsely accused her of misconduct and also a judgment that $1,272 was due her for pension (TELEPHONY, October 21, page 29).

Most of the supporting brief is devoted to an attack on the holding of Judge Rose that the company provided the pension voluntarily and gratuitously and was at liberty to prescribe the conditions on which pensions are granted. The trust fund, contributed to alone by the company for pensions, is protected by the provision that an employe can acquire no pension right for a term of service shorter than that specified in the plan.

Attorneys for Miss Twiss say that the pension plan, instead of being a gratuity, constitutes a contract between employer and employe, the employe's years of service being a sufficient consideration to support the continuing promise of the employer to pay pension benefits, and that, therefore, under such a contract legal rights enforceable by the courts are conferred on the employe of which she cannot be deprived by the wrongful action of the employer.

The attorneys argue that under the construction placed upon the plan by the court the company could avoid paying any pensions at all by discharging the employe after years of service but before the prescribed term had expired, overlooking the fact that the company has never done so and that it now has a pension roll. They say that since the jury found the discharge was wrongful, the court must award her pension rights, since the offer of a retirement allowance was an inducement to remain in the service.

▼ ▼

"Double Thanksgiving" Creates Rate Problem

Nebraska will have two Thanksgiving days: November 23, named by President Roosevelt, and November 30, named by Governor Cochran. The Northwestern Bell Telephone Co. and the Lincoln Telephone & Telegraph Co., finally decided to solve the rate problem, created by the two holidays, by asking the state railway commission to allow them to offer Sunday rates for the governor's Thanksgiving.

▼ ▼

Summary of Commission Rulings and Hearings

Alabama Public Service Commission

October 26: Hearing on request of Frankville Telephone Co. for authority to construct a new line from Chatom to Fruitdale, to connect with the Southern Bell Telephone & Telegraph Co. line into Mobile.

Kansas Corporation Commission

November 7: Hearing on application of Clearwater Telephone Co. for authority to make certain changes in rates for service in Clearwater.

November 16: Hearing on application of Central Kansas Telephone Co. for authorization to discontinue its Linwood exchange.

November 16: Hearing on application of Central Kansas Telephone Co. for authority to make certain changes in rates for service in Mound Valley.

November 17: Hearing on complaint of Mason McComb against boundary lines of Southwestern Bell Telephone Co. and the Western Light & Telephone Co.

Michigan Public Service Commission

October 24: Michigan Associated Telephone Co. authorized to purchase and Michigan Bell Telephone Co. authorized to sell certain property except instruments, located in and near the village of Fruitport, Muskegon county. Michigan Associated Telephone Co. authorized to enforce, within the area acquired by it, the general rules and rates of the Muskegon exchange and to put into force and effect, for the rendering of automatic dial rural service in the acquired area, a proposed schedule of locality rates.

As a result of this order, 22 present

subscribers will have their service transferred from the Michigan Bell company's Grand Haven exchange to the Michigan Associated company's Muskegon exchange.

October 24: Michigan Bell Telephone Co. authorized to purchase, and Home Telephone Co. of Grass Lake, authorized to sell, 14 service station lines, serving approximately 108 customers, connected with the former's Jackson exchange and one service station line, serving four customers, connected with the former's Napolen exchange.

The Michigan Bell was also authorized to put into force and effect, in the acquired territory, the rates and regulations generally applicable at each respective exchange.

Missouri Public Service Commission

October 23: The United Telephone Co. filed application for approval of rate increases for all types of service at its Pilot Grove exchange.

The company said the present rates are insufficient to pay operating and maintenance expenses for the exchange. The increases asked range from 25 to 50 cents.

Nebraska State Railway Commission

November 1: Lincoln Telephone & Telegraph Co. given authority to cancel two-party service at its Grafton exchange and to revise tariffs.

November 1: Lincoln Telephone & Telegraph Co. given authority to revise schedules at its exchanges at Benedict, Bradshaw, Waco, York, Thayer, McCool, Stromsburg, Thayer and Polk to provide that hereafter rural subscribers should have choice of one additional exchange instead of two as heretofore.

November 1: E. Headrick given authority to establish a schedule of rates for an exchange to be erected at Dunning.

New York Public Service Commission

November 9: Hearing in New York in the proceeding on motion of the commission as to books, records and accounts of New York Telephone Co. and entries reflecting acquisition of property from other telephone companies.

Ohio Public Utilities Commission

October 31: Pleading that between August 1, 1936, and August 31, 1939, it has made uncapitalized expenditures from its treasury of $309,520.40, the Mansfield Telephone Co. filed petition for authority to reimburse its treasury by issuing and selling at $23.25 per share, 13,313 shares of no par common stock.

October 31: No opposition having been offered, the commission authorized the Ohio Bell Telephone Co., effective November 1, upon conversion of rural lines of the Gallipolis exchange from magneto to automatic dial operation, to revise its rural rates in the exchange as follows: rural business, $1.75 to $3.25; rural residence, $1.75 to $2.00 per month.

October 31: Commission secretary certified to the company and to the mayors of the communities affected, reports substantiating the representation of the Ohio Bell Telephone Co. that substantially all of the affected subscribers have agreed to the increases in rates proposed in the following exchanges on conversion from magneto to automatic dial service:

Jamestown: Business independent, $3.50 to $4.00; business two-party, $3.00 to $3.50; business rural, $3.00 no change; residence independent, $2.25 to $2.75; residence two-party, $2.00 discontinued; residence four-party, $2.00, new; rural residence no change.

Bellbrook: Same rates as Jamestown; Bowersville and Cedarville, the same as Jamestown, except at Cedarville, where residence four-party service will be $1.75; rates at Spring Valley will be the same as Jamestown.

October 31: Chillicothe Telephone Co. authorized to discontinue, effective November 1, in all of its exchanges including Chillicothe, Bainbridge, Bourneville, Clarksburg, Frankfort and Kingston, the 25-cent monthly rental in excess of deskset rental for handsets; also to cancel the prevailing 10-cent toll for service between the Clarksburg and Frankfort exchanges.

Oklahoma Corporation Commission

October 27: Following a hearing before Ed White, referee, the commission dismissed the citation against the Terrall Telephone Co., alleging inadequate exchange service at Terrall. J. E. Frisk, owner, has installed a new switchboard and other equipment, repaired lines, and materially improved the service.

October 31: The commission granted the application of C. E. Devin of Apache, to sell, and of C. L. Moore, of Elgin, to purchase, the exchange at Cyril. Mr. Devin, who is owner of the Apache Telephone Co., and president of the Oklahoma Telephone Association, operated the Cyril exchange up to date of sale.

Wisconsin Public Service Commission

November 2: Commonwealth Telephone Co. given authority to revise rates in Hubertus, Cedar Grove and Costburg. Exchanges in Cedar Grove and Costburg were considered as a regional unit with a rate base of $55,000 for rate purposes.

"Combining the net income of Costburg and the deficit at Cedar Grove and relating them to the rate base, a rate of return of approximately 4.1 per cent is indicated for the two exchanges," the commission said.

Under the new rates, Costburg, Cedar Grove and Hubertus subscribers will pay $2.75 net per month for one-party business service and $2.00 net for residence service. Former rates were $2.00 at Costburg, $3.00 at Cedar Grove and $1.75 at Hubertus for business telephones, and $1.75 at Costburg, $2.25 at Cedar Grove and $1.50 at Hubertus for residence telephones.

November 13: Hearing in Madison on application of Belmont-Pleasant View Telephone Co. to extend its lines to serve the new Fayette county highway garage.

November 20: Hearing in Waukesha on alleged refusal of the Wisconsin Telephone Co. to serve Herman Klug and two others in section one, town of Mukwonago, Waukesha county.

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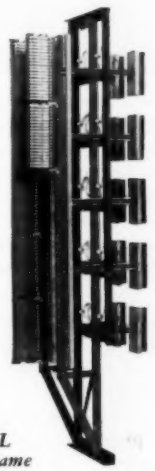

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TERMINAL AND PROTECTION EQUIPMENT

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M. K. McGrath Elected President of Kellogg Company

THE BOARD of directors of the Kellogg Switchboard & Supply Co., at a meeting on October 31, elected Maurice K. McGrath to the presidency. Mr. McGrath succeeds J. G. Kellogg who resigns but who retains his directorship in the company and will continue to be active in the company's affairs.

Mr. Kellogg's retirement from the presidency is the result of his desire to be freed of some of his responsibilities so that he may be able to devote more time to his other interests. His material financial interest in the Kellogg company remains unchanged, and his long experience in the business and his intimate knowledge of the telephone field will be available, as it has always been in the past, to the company, its officers and personnel.

The new president brings to Kellogg a broad knowledge of the telephone field, for Mr. McGrath has been associated with the communications industry for the past 44 years. His interest in telephony can almost be termed hereditary because his father was an intimate friend and associate of Theodore N. Vail in the early days of the United States Railway Mail Service. Together they burned the midnight oil before Vail left the government service to make telephone history.

Maurice K. McGrath started his telephone career in 1895 in the Western Electric shops when they were located in Clinton Street, Chicago. He worked his way through the drafting room to the charge of circuit work and finally the leadership of the Chicago experimental laboratory. In 1904 a call came for an assistant chief engineer for the Bell Telephone Mfg. Co. in Antwerp, Belgium, then the company's largest foreign factory, and Mr. McGrath was chosen for the job. He arrived in Belgium with his bride and spent the next five years introducing common battery equipment on the continent.

In 1909 the Italian government inaugurated an extensive program of consolidation and reconstruction of telephone plants in all the principal cities and Mr. McGrath went to Rome to found the Italian branch of the Western Electric Co. as its chief engineer.

This program of modernization along American lines included the planning of many big city telephone installations under unusual conditions. This also comprised the hurried installation of temporary central offices in 15th century palaces which had been taken over by the government from defunct noble families.

Naturally the architects of prior centuries left no blueprints or specifications and a major problem was to calculate the stresses which could be borne by the ancient masonry arches and to distribute the weight of 20th century

New president of Kellogg Switchboard & Supply Co., MAURICE K. McGRATH has had many years of telephone engineering and manufacturing experience. He is also well acquainted with the independent telephone field through his duties in the telephone department of the Postal Telegraph Co.

equipment accordingly. The Tripolitan War of 1911 delayed this program and it was finally abandoned at the outbreak of the World War. At this time Mr. McGrath returned to America and to the Bell Telephone Laboratories, Inc., in New York.

The entrance of the United States into the war became obvious in 1916 and he began to prepare himself by attending the officers' training camp at Plattsburg and later joined the Officers Reserve Corps. At the declaration of war by the United States, he was chosen to command the Signal Corps radio company which he organized among his friends in the Bell laboratories.

Before the company was called to active duty, however, General Pershing and his staff had reached France and a call came back for the organization of a scientific and technical division for the Signal Corps, to study the many new communication and observation problems arising in modern warfare; and to obtain, inspect, and maintain the multitude of new types of radio, electrical and physical apparatus that modern armies had developed.

The War Department requested General J. J. Carty to organize such a unit which, according to British precedent was known as the research and inspection division. Major H. H. Shreeve, inventor of the first practical telephone repeater, was placed in command of the division; Dr. Oliver Buckley, now director of research of the Bell laboratories, commanded the research section; and Captain McGrath organized and commanded the technical section. In this division there were some of the brightest technical minds in the United States, some of whom, like Major E. H. Armstrong, have acquired enduring fame.

As soon as possible after peace was declared, Major McGrath secured his discharge to become manager and then managing director of the Western Electric Co.'s interests in France. At this time dial telephones and loaded and repeatered toll cables were just coming into general use and the manufacturing problems were many. Paris, with nearly 400,000 stations, was, of course, a major problem in itself.

Fourteen years ago Mr. McGrath left the Bell System to go with the International Telephone & Telegraph Co., when that organization entered the manufacturing field and took over the foreign interests of the Western Electric Co. At that time, the I. T. & T. had just secured a national telephone franchise in Spain and set up a European general staff in London which Mr. McGrath joined in 1929. There he was in active charge of publicity and public relations for the system in Europe with the duty of coordinating such efforts in its many companies in nearly 40 countries outside of the United States.

Mr. McGrath's duties in this capacity required great organizing ability and

diplomacy. He was frequently called upon to handle ceremonies connected with the inauguration of various services. Naturally, handling the inauguration of the telephone service in Vatican City by Pope Pius IX and the trans-Atlantic conversation between King Alfonso of Spain and the late President Coolidge with Court and Cabinet in attendance are matters very carefully planned to prevent any mishap. And while they are something to look back on with pride, the work of organization at the time included an enormous mass of varied detail in which Mr. McGrath actively participated.

In 1932 the foreign general staff of I. T. & T. was greatly reduced and Mr. McGrath returned to America as vice-president of the Postal Telegraph-Cable Co. with headquarters in his native city of Chicago. This brought him into the Independent operating field. He sponsored the plan to establish Postal Telegraph agencies in Independent telephone offices and was actively engaged in offering this cooperative service to the Independent companies. The program was consummated with unusual success and resulted in considerable additional revenue to the Independent operators.

In this work Mr. McGrath made many additional friends in the Independent telephone field. His qualifications and experience fit in admirably for the executive post to which he has been elected by the Kellogg company. He announces that the tried and proven policies of the company will be continued and that the company will, as always, endeavor to lead in the development and manufacture of the kind and quality of equipment which is needed by the operating companies.

Exhibits Show Losses On Oklahoma Exchange

EXHIBITS to show net losses ranging from .76 per cent to 5.75 per cent on its local exchange business in Oklahoma, excepting Oklahoma City and Tulsa, were introduced in the statewide rate hearing of the Southwestern Bell Telephone Co., on its application to the Oklahoma Corporation Commission for increased rates.

The exhibits were in connection with testimony given by W. P. Clark, auditor, Southwestern Bell Telephone Co., St. Louis, Mo., just before the hearing recessed on November 3, to resume November 7. The testimony, supported by exhibits covering revenues and expenses for 1938 for each of the 144 towns and a summary exhibit covering all business of the company in the state, showed that the Oklahoma City and Tulsa exchanges, taken together, had a net return for 1938 of 5.59 per cent.

The group of 144 towns involved in the federal court injunction showed an overall deficit of .9 per cent for 1938 and the 22 towns, all but one of which are involved in an application for temporary rate increases pending outcome of the statewide hearing, showed a deficit of .76 per cent, according to Mr. Clark's exhibits. One hundred three towns showed an overall loss of 5.75 per cent. When the revenues of the Oklahoma City and Tulsa exchanges were used to compute the total 1938 return, however, Mr. Clark's figures showed a net return on exchange business in Oklahoma for 1938, of 2.44 per cent.

Computing all revenues and expenses on combined toll and exchange business for the company made an overall net return in the state of 3.46 per cent, according to the testimony. This return, the company contends, is inadequate. The company contends that each of its exchanges in the state should show a fair return on the investment in the particular exchange, whereas most of them show substantial net losses.

Just before the week-end recess, on November 3, John H. Cantrell, general attorney of the Southwestern Bell for Oklahoma, made application to the commission for a supersedeas order to permit his company to put in temporary rate increases in the 21 towns. Earlier in the week the company had filed a formal petition with the commission giving notice of appeal to the state supreme court seeking permission to put in effect the increased rates in the 21 towns pending outcome of the statewide hearing. The commission reserved its ruling on the supersedeas application until November 7.

In a statement regarding proposed rate increases for the 21 towns, M. J. Stooker, general manager of the Southwestern Bell for Oklahoma, said:

"As a further step in our efforts to halt the confiscation of our property we have today filed application for a writ of supersedeas and certification of

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These four simple steps—

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Drop Wire Construction Methods (Cont.)

It is often necessary to extend a drop wire several spans from the cable terminal in order to reach a point suitable for the drop to leave a pole and extend into the subscriber's premises. Attachment to the poles at each end of the run can be made either by porcelain dead-end knobs and ties or preferably drop wire clamps and hooks. Support of the drop wire at intermediate points can be made by using C knobs for parallel wire or regular two-groove knobs for twisted pair. There is also available a drop wire clip which can be used for intermediate supports.

These clips are attached to the drop wire at the point of support by wrapping around the wire and pressing the sides of the clip against the wire with a pair of pliers. The clip is then hung onto a drive hook which is driven into the side of the pole. Several drop wires can be supported on one drive hook. This type of support is easy to install and to remove and presents a neat appearance. Its use is shown in Fig. 16. Horizontal drop wire runs should preferably be placed from 6 inches to 12 inches below the cable if one exists.

Protecting Drop Wire from Trees

Telephone drop wire has an extremely short life where placed in such manner that it can be rubbed by tree limbs. To avoid tree damage, drop wire installlations should, if possible, be routed to avoid present or future contact with tree branches. Where it is impossible to prevent running drop wire through trees some form of protective covering for the drop wire should be provided. For this purpose there can be obtained what is known as tree loom and also wood tree guards.

Tree loom is a tough, flexible fabric conduit which must be slipped over the wire to be protected and which has a length sufficient to reach several feet on each side of the tree hazards. The loom is kept from slipping by placing tape or tie wire at each end of the loom. Fig. 17 illustrates a typical installation of tree loom.

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By B. C. Burden

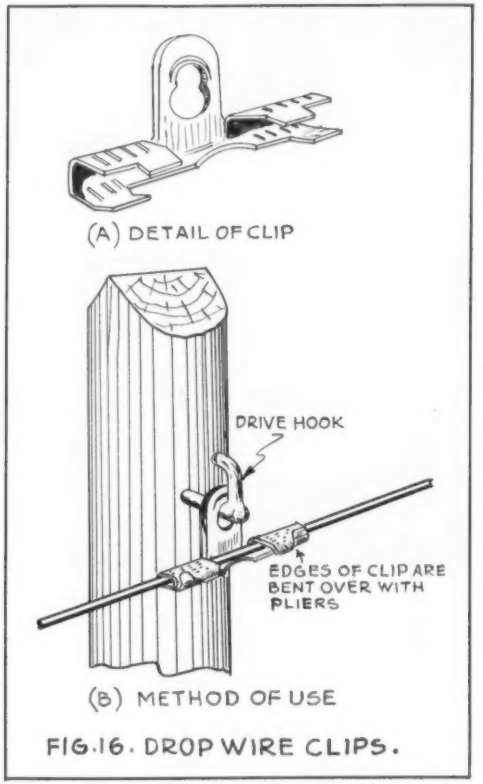

FIG. 16. DROP WIRE CLIPS.

Wood tree guards have the advantage over loom in that they can be placed on drop wires after they are installed. The guard is a section of split wood conduit which is placed over the drop wire and the two halves wired together, using ordinary iron wire. Tape is placed around the drop wire at each end to prevent the guard from working away from the area to be protected.

In some cases where drop wire must necessarily pass

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By B. C. Burden

through trees it is practical to attach it to the tree in such manner that it will be held away from the tree limbs and yet not be damaged by tree movement. Fig. 18 shows a typical installation of this type.

Obstructions on Buildings

Obstructions on buildings, such as downspouts, cornices, pipes, etc., require some added protection for wires to prevent possible future wear and consequent trouble. For passing a simple obstruction such as a cornice or projecting course of bricks, a bridle ring should be placed on each side of the projection and the

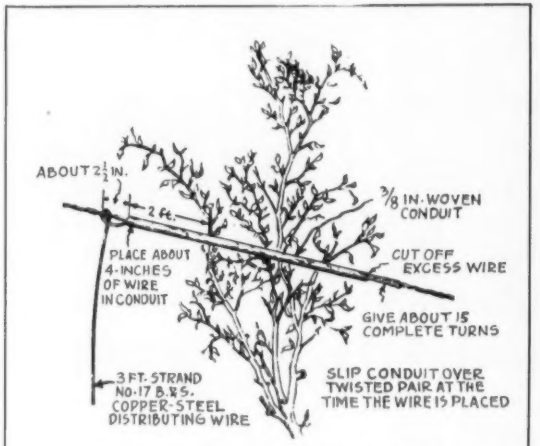
ABOUT 2½ IN.
2 Ft.
⅜ IN. WOVEN CONDUIT
PLACE ABOUT 4-INCHES OF WIRE IN CONDUIT
CUT OFF EXCESS WIRE
GIVE ABOUT 15 COMPLETE TURNS
3 FT. STRAND NO. 17 B.&S. COPPER-STEEL DISTRIBUTING WIRE
SLIP CONDUIT OVER TWISTED PAIR AT THE TIME THE WIRE IS PLACED

FIG. 17. USE OF LOOM TO PREVENT TREE DAMAGE TO DROP WIRE.

drop wire should be taped at the point likely to make contact. Use two layers of ordinary black friction tape for this purpose. In passing under or over a run of low-voltage power wiring the drop wire should be run through a four-inch porcelain tube at the crossover. Tape wound on the drop wire at each end of the tube prevents it from moving.

Answers to Traffic Questions on Page 25

1. The call should be registered as soon as you hear the subscriber's voice.
2. The entry in the "Special Instruction" space should be encircled.
3. The initial period is three minutes, the same as on a person-to-person call.
4. Please refer to preface for answer.
5. Yes. This is the toll center operator's responsibility.

the record on appeal to the state supreme court. In substance we are asking the corporation commission to make it possible for us to place in effect increased rates in 21 towns under bond to protect subscribers against loss if these rates are not subsequently upheld. These proposed rates, a list of which accompanies our application, would produce only a moderate return on our investment in these 21 towns."

Earlier W. B. Stephenson, Southwestern Bell engineer for Oklahoma, testified as to savings to the company, due to services of the Bell Laboratories, Inc., New York City. He estimated total savings on this service for the year ended December 31, 1938, at $207,119 for the state. Total annual savings because of the license contract services of the A. T. & T. Co., to the Southwestern Bell, he estimated, at 11.2 per cent of revenues for Oklahoma. For these services the Southwestern Bell in Oklahoma paid 1½ per cent of its gross revenues in 1938 or a total of $176,000, he testified.

H. R. Fritz, St. Louis, Mo., inventory cost engineer of the Southwestern Bell, was recalled to the stand to testify further as to depreciation. He stated that the realized life of buildings of the company retired in Oklahoma has averaged 14 years and the overall life 20 years but that he anticipates a future realized life on buildings now in service of 27 years because of better and more permanent average construction.

Average overall life of main underground conduit he estimated at 75 years and of subsidiary conduit, 60 years. He placed the average life of brick manholes at 30 years and concrete manholes at 50 years. The overall depreciation reserve rate on all property of the company in Oklahoma, used and useful in the telephone business, was at 5.3 per cent in 1926 and 3.9 per cent for 1938, he testified.

The main witness for the week was E. H. Dinwiddie, of Oklahoma City, inventory cost engineer of the Southwestern Bell for Oklahoma. He was in charge of the inventory and cost appraisal of Southwestern Bell property in Oklahoma for purposes of the present hearing. In making appraisals he cooperated with engineers of the commission but the engineers of the state and the company did not agree on all points. He testified that he and his associates personally inspected all property of the company in the state, with the exception of subscribers' stations, and that about 10 per cent of these were examined.

Mr. Dinwiddie prepared and introduced a series of exhibits for each of the 144 telephone exchanges of his company in the state showing various cost accounts on a basis of reproduction cost new of the property and reproduction cost new, present condition. He explained that his inventory shows what it would cost at material and labor costs, as of December 31, 1938, to reproduce each of the telephone exchanges, and the toll properties of the company in Oklahoma in the condition as he found the properties upon inspection.

On the foregoing basis Mr. Dinwiddie found the present fair cash value of all property of the Southwestern Bell in Oklahoma, used and useful in the telephone service, as of December 31, 1938, to be not less than $51,500,000. To arrive at these figures he included total property, exchange and toll, for that year with reproduction cost new value of $51,794,888.39, and present condition value of $47,139,399.77. To the latter figure he added the going concern value, which brought the fair cash value up to $51,500,000.

Explaining his method of appraisal in detail Mr. Dinwiddie took up at length the Norman exchange exhibits. He testified that the same methods were used in appraising the value of all other exchanges in the state.

To arrive at his final reproduction new cost figures present condition for

POLES

B. J. Carney & Co., 100 N. 7th St., Minneapolis, Minn.—Western red cedar poles. Pentrex Butt Treated or Plain.

C. M. Christiansen Co., Phelps, Wis.—Northern White Cedar Poles, plain or butt treated. Quotations on request.

International Creosoting and Construction Co., Galveston, Texas.—Creosoted Southern Yellow Pine Poles. Plants: Beaumont and Texarkana, Texas.

MacGillis & Gibbs Company, Milwaukee, Wis.—Northern White and Western Red Cedar Poles. Plain or butt-treated. Immediate quotations on request.

T. M. Partridge Lumber Co., Minneapolis, Minn.—Northern White—Western Red Cedar Poles. Plain or butt-treated.

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POSITION WANTED—Man, 33 years old, married, 12 years' widely varied experience plant and commercial, capable of managing large exchange or group of exchanges, wishes connection with good Independent telephone company. Employed at present. Location no object. Address 8837 care of TELEPHONY.

POSITION WANTED: Twenty years' experience Plant and Central Office maintenance, manual and automatic. Willing to start at reasonable salary in any locality. Address 8791, care of TELEPHONY.

POSITION WANTED: By man with 12 years' experience on magneto and C.B., knowing all phases telephone work. Prefers one man plant; go anywhere. References. Address Waldo Phend, 901 Walnut St., Iowa City, Ia.

POSITION WANTED: Telephone operator or manager in charge. Twelve years' experience, executive ability. Widow. Excellent references furnished. Address Josephine Howell, Nevada, Mo.

RECONDITIONED EQUIPMENT, Western Electric No. 534 signal sets less ringers, @ $3.35; Western Electric No. 21 D. Condensers @ $0.25 each; Cook B-7 Station Protectors, @ $0.50. **Independent Telephone Repair Company,** 1432 W. 15th St., Chicago, Ill.

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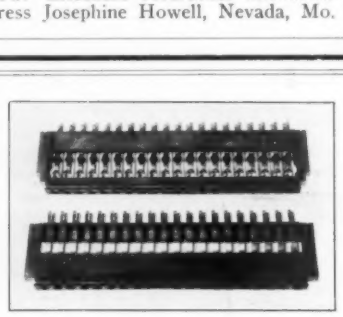

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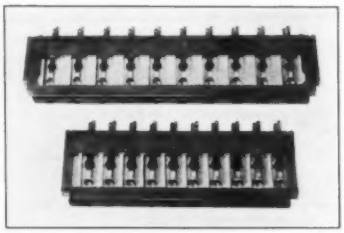
S.C. Co. No. 121 on No. 60 mtg.
S.C. Co. No. 121 on No. 61 mtg.
S.C. Co. No. 121 on No. 79 mtg.
S.C. Co. No. 121 on No. 80 mtg.
S.C. Co. No. 121 on No. 81 mtg.
S.C. Co. No. 121 on No. 82 mtg.
S.C. Co. No. 121 on No. 83 mtg.



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each exchange, Mr. Dinwiddie deducted a certain percentage to indicate present condition as compared with an absolutely new plant.

In arriving at his valuations Mr. Dinwiddie added 4 per cent for engineering costs, 2 per cent for commissions and contingencies and 1.3 per cent for general administration costs. He also added to the reproduction new, present condition valuation of each exchange the going concern value. This included interest and taxes on part of the plant completed but idle before being placed in operation and costs of establishing the business of the exchange, including training of operators, setting up of books and records, and obtaining subscribers.

He explained that engineering costs are usually placed at 5 per cent by other concerns and that he did not include any so-called intangible values, but only reproduction costs based upon actual experience of his company in establishing its exchanges.

Questions asked by L. V. Reid, general attorney, S. J. Gordon, assistant attorney, and Paul Reed, auditor of the commission, indicated that several methods used by the telephone company in arriving at its valuations will be attacked, including the manner of arriving at present condition of the property, and estimating going concern values.

ELECTRONIC DEVICES IN TELEPHONY

(Concluded from page 14)

non-linear characteristics so that the waves are distorted and sum and differences frequencies are created. Thus, if a carrier voltage of frequency, f_c, and a voice voltage, f_v, are modulated, then in the output, components of $f_c - f_v$ and $f_c + f_v$ will be found.

The first of these is called the lower side band, and the second is called the upper side band. If, as for test purposes, the "voice" voltage is a pure sine wave of single frequency, then each of the side bands will be a single frequency. If this is an actual voice signal, then $f_c - f_v$ and $f_c + f_c$ will be bands of frequencies.

Each of these contains the entire intelligence of the speech, and it is only necessary to transmit one of these to the distant station to carry on a conversation. To make the signal again audible to the distant listener, the carrier frequency must be there supplied and the signal demodulated as will be explained in the next article of this series.